

## CERTIFICATE OF TRANSLATION

As a below named translator, I hereby declare that my residence and citizenship are as stated below next to my name and I hereby certify that I am conversant with both the English and Korean languages and the document enclosed herewith is a true English translation of the Priority Document with respect to the Korean patent application No. 1997-29836 filed on 30 June 1997.

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## **[ABSTRACT OF THE DISCLOSURE]**

### **[ABSTRACT]**

Disclosed is a method for displaying a selected channel in a digital television receiver. The channel displaying method enables a user to easily confirm the number of programs being broadcasted on a selected RF channel and easily select a desired program. When two or more programs are being received on a selected RF channel, one of the programs is selected and outputted as a program-being-watched. At the same time, the program number of the program-being-watched and sub-channel symbols corresponding to the program numbers of the remaining programs are displayed in numeric order on the digital TV receiver. A user can select another program by inputting a channel up/down key for selecting a program number displayed in the up or down direction from the number of the program-being-watched.

### **15 [REPRESENTATIVE FIGURE]**

**FIGURE 2**

### **[INDEX]**

**[SPECIFICATION]**

**[TITLE OF THE INVENTION]**

**METHOD FOR DISPLAYING CHANNELS IN DIGITAL  
TELEVISION RECEIVER**

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**[BRIEF DESCRIPTION OF THE DRAWINGS]**

FIG. 1 is a block diagram of a HDTV receiver to which the present invention is applicable;

FIG. 2 is a flow chart showing a process performed by a microprocessor  
10 of FIG. 1 according to a preferred embodiment of the present invention; and

FIG. 3 shows an example of channel display according to the preferred embodiment of the present invention.

**[DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT]**

15 **[OBJECT OF THE INVENTION]**

**[RELATED FIELD AND PRIOR ART OF THE INVENTION]**

The present invention relates generally to a digital television ("TV") receiver, and more particularly to a method for displaying a selected channel on a display of a digital TV receiver.

20 In analog TV broadcasting, such as NTSC (National Television System Committee) system based broadcasting, only a single program can be broadcasted on a fixed frequency bandwidth of one RF (radio frequency) channel.

By contrast, next-generation digital TV broadcasting, such as HDTV (High Definition TeleVision) broadcasting, can deliver many more RF channels

than the analog TV broadcasting. Also, digital TV broadcasting can flexibly assign appropriate bit rates to provided services, if required. In other words, a plurality of programs can be broadcasted within a limited transmission bandwidth of one RF channel. Thus, it is possible to broadcast SD (standard  
5 definition) programs, such as general analog TV broadcasting programs, on multiple channels in a particular time zone and HD programs on a single channel in another time zone. For example, according to the US ATSC (United States Advanced Television System Committee) standard, one RF channel equivalent to one analog channel is recommended to be subdivided into up to six sub-channels  
10 so that a digital TV can broadcast at least one HD program or up to 6 SD programs at the same time.

Since digital TV broadcasting transmits a plurality of programs on a single RF channel, it is required to display program guide information on a display of a digital TV receiver so that a user can select one of the plurality of  
15 programs. To this end, the ATSC standard defines an electronic program guide (EPG) to provide a method of selecting a program. That is, a TV station transmits EPG information of each RF channel. A digital TV receiver stores the received EPG information and displays it when the user wishes to see it.

From the EPG information, the user can confirm the number of programs  
20 being broadcasted on sub-channels of an RF channel. However, the user should separately select a display of the EPG information. In addition, it is troublesome to confirm the number of programs being broadcasted on a selected RF channel and select a desired program in digital broadcasting, as compared to the existing analog TV broadcasting. Since a TV station may deliver both

analog broadcasting and digital broadcasting, users may be further confused when selecting a channel and a program.

#### **[SUBSTANTIAL MATTER OF THE INVENTION]**

5       As described above, in digital TV broadcasting, it is required for a user to easily confirm the number of programs being broadcasted on a selected RF channel and easily select a desired program.

It is, therefore, a first object of the present invention to provide a method for displaying channels in a digital TV receiver to enable a user to easily confirm  
10 the number of programs being broadcasted on a selected RF channel.

It is a second object of the present invention to provide a method for displaying channels in a digital TV receiver to enable a user to easily select any program being broadcasted on a selected RF channel.

#### **15 [CONSTRUCTION AND OPERATION OF THE INVENTION]**

In order to accomplish the first object, the present invention selects and outputs one program as a program-being-watched, when two or more programs are running on a selected RF channel. Also, the present invention displays the program number of the program-being-watched, together with sub-channel  
20 symbols corresponding to the program numbers of the remaining programs, in numerical order on a display of a digital TV receiver. In order to accomplish the second object, the present invention changes the program-being-watched to a program corresponding to the program number selected using a channel up/down key, among the program numbers displayed in the up or down direction from the

program number of the program-being-watched.

Hereinafter, a preferred embodiment of the present invention will be described with reference to the accompanying drawings. Although certain processes or pictures are specifically exemplified in the following description of  
5 the present invention and in the drawings, it will be obvious to those skilled in the art that such examples are merely to improve understanding of the present invention and that the present invention is not limited to such specific examples. Also, in the following description of the present invention, a detailed description of known functions and configurations incorporated herein will be omitted when  
10 it may make the subject matter of the present invention rather unclear.

FIG. 1 is a block diagram of a HDTV receiver adopting the MPEG (Moving Picture Expert Group) standard, to which the present invention is applicable. Referring to FIG. 1, a tuner 102 tunes an RF channel from broadcasting signals received through an antenna 100 under the control of a  
15 microprocessor 124, and outputs an intermediate frequency (IF) signal. An IF module 104 converts the IF signal into a baseband signal and outputs the baseband signal to a channel decoder 106. The channel decoder 106 decodes the baseband signal received from the IF module 104 and reproduces a data bit stream. The reproduced data bit stream is separated into audio data, video data  
20 and additional data by a TS (transport stream) decoder 108.

The audio data is applied to an audio decoder 110 to be decoded according to the MPEG standard or the Dolby AC-3 standard. An audio processing and outputting section 112 processes the decoded audio data and outputs it to a speaker 114. The video data is applied to a video decoder 116 to

he decoded according to the MPEG standard. The decoded video data is applied to an OSG (On Screen Graphic) mixer 118 to be mixed with OSG data under the control of the microprocessor 124. A video processing and outputting section 120 processes the mixed data and outputs it to a display through a picture tube 122. The OSG data is required for the microprocessor 124 to display any information in the form of graphic or text on the display.

A keypad 130 and an IR (infrared) receiver 134 are connected to the microprocessor 124, which is a control section of the HDTV receiver, through a user interface 128. The microprocessor 124 operates according to a command inputted from an IR remote 132 through the keypad 130 or the IR receiver 134, based on a program stored in a memory 126. The IR remote 132 can be a wireless mouse, such as an air mouse, or a remote controller (REMOCON). A command applied from the IR remote 132 is received as an IR signal by the IR receiver 134 and transmitted to the microprocessor 124 through the user interface 128. Also, additional data is applied to the microprocessor 124 from the TS decoder 108. The additional data includes EPG information as described above or PSI (program specific information) as defined in the MPEG standard.

The memory 126 comprises a ROM (read only memory) for storing a program of the microprocessor 124, a RAM (random access memory) for temporarily storing data according to the implementation of the program of the microprocessor 124, and an EEPROM (electrically erasable and programmable ROM) for storing various reference data.

The tuner 102, IF module 104, channel decoder 106, TS decoder 108, audio decoder 110, audio processing and outputting section 112, video decoder

116, OSG mixer 118, video processing and outputting section 120 and memory 126 as explained above are connected to each another via a bus 136 connected to the microprocessor 124.

FIG. 2 is a flow chart showing a process according to the preferred embodiment of the present invention which is applicable to a digital TV receiver such as a HDTV receiver as explained above. The process as depicted in the flow chart is programmed in the ROM of the memory 126 to be implemented by the microprocessor 124.

The process for displaying channels according to the preferred embodiment of the present invention will be explained in more detail with reference to FIGs. 1 and 2. When a user inputs a key for designating the channel number of a channel desired to be selected using the keypad 130 or IR remote 132 of FIG. 1 (step 200), the microprocessor 124 controls the tuner 102 to select an RF channel corresponding to the inputted number in response to the key input (step 202). Accordingly, an IF signal of the RF channel selected by the user is outputted from the tuner 102 and converted into a baseband signal in the IF module 104. The converted signal is then channel-decoded by the channel decoder 106, thereby reproducing a data bit stream. The reproduced data bit stream is divided into audio data, video data and additional data by the TS decoder 108.

At step 204, the microprocessor 124 confirms, from EPG information or PSI included in the additional data applied to the TS decoder 108, whether the number of programs running on the currently selected RF channel is two or more. If only one program is running, its audio and video data will be outputted from



the TS decoder 108. Accordingly, the sound and image of that program will be outputted through the speaker 114 and the picture tube 122, respectively.

If it is determined at step 204 that two or more programs are running on the selected RF channel, the microprocessor 124 will select one of those 5 programs (step 206). For example, the microprocessor 124 will control the TS decoder 108 to select a program with the lowest program number as the program-being-watched. The audio and video data of the selected program will then be outputted from the TS decoder 108. Accordingly, the sound and image of the viewing program will be outputted through the speaker 114 and the picture tube 10 122, respectively.

At step 208, the microprocessor 124 displays the program number of the program-being-watched and the sub-channel symbols on the display, using the OSG mixer 118. The program number of the program-being-watched is a unique number assigned to a program selected as the program-being-watched, 15 among the programs running on the currently selected RF channel, whereas the sub-channel symbols represent the program numbers of the remaining programs. The microprocessor 124 displays the program number of the program-being-watched and sub-channel symbols corresponding respectively to the program numbers of the remaining programs in numeric order on the display, together 20 with the selected RF channel number.

FIG. 3 shows an example of how to display the program number of the program-being-watched and the sub-channel symbols according to the preferred embodiment of the present invention. Referring to FIG. 3, RF channel "32" is selected. Four programs with unique program numbers, including the lowest

program number "22" and the second lowest number "40", are broadcasted on the RF channel "32". Two symbols ▲ and ▼ are used as examples of sub-channel symbols. These symbols indicate program numbers higher or lower than the number of the program-being-watched. To be specific, the sub-channel symbol ▲ indicates a program number following the number of the program-being-watched, while the symbol ▼ indicates a program number preceding the number of the program-being-watched.

Referring to FIG. 3(a), a program with the lowest number "22", among the four programs running on RF channel "32", is selected as the program-being-watched. FIG. 3(a) shows an example of channel display where RF channel number "32", three sub-channel symbols ▲ and lowest program number "22" are displayed longitudinally on the left upper part of the display.

Therefore, even without any additional operation after selecting a RF channel by inputting a number key, the user can directly confirm the number of programs running on the selected RF channel, in view of the program number of the program-being-watched and sub-channel symbols displayed on the display.

At steps 210 and 212, the microprocessor 124 determines whether a channel up/down key or a number key for designating a channel number has been inputted. The user can select a program of any other sub-channel by inputting the channel up/down key using the keypad 130 or the IR remote 132. When there is an input of the channel up/down key (step 210), the microprocessor 124 selects a program number designated by the channel up/down key, which precedes or follows the program number of the program-being-watched, and controls the TS decoder 108 to change the program-being-watched to a program

corresponding to the selected program number (step 214). The microprocessor 124 then returns to step 208.

For example, if the user inputs a channel up key in the state of display as shown in FIG. 3(a), the display will be changed to that of FIG. 3(b). FIG. 3(b) shows that the program number "40" selected by the channel up key is the second lowest number. If the user inputs a channel down key in the state of display as shown in FIG. 3(a), the highest program number represented by the first of the three sub-channel symbols ▲ will be displayed. At the same time, the remaining three program numbers will be indicated by the sub-channel symbol ▼.

As described above, the user can easily confirm the number of programs running on a selected RF channel from the program number of the program-being-watched and sub-channel symbols displayed on the display, and thus can easily select a desired program using the channel up/down key.

If the user inputs a key designating a particular channel number at steps 210 and 212 in order to select another RF channel, the microprocessor 124 will return to step 202.

While the invention has been shown and described with reference to a certain preferred embodiment thereof, it will be understood by those skilled in the art that various changes in form and details may be made therein without departing from the spirit and scope of the invention as defined by the appended claims. Although only an application to a IIDTV receiver has been described above, the present invention is also applicable to all digital TV receivers. Also, although the preferred embodiment explained above enables the user to confirm

the number of programs running on a selected RF channel and select a desired program using the channel up/down key, it is possible to modify the invention to enable the user only to confirm the number of programs running on a selected RF channel. Therefore, the present invention is not to be unduly limited to the  
5 embodiment set forth herein, but to be defined by the appended claims and equivalents thereof.

#### **[EFFECTS OF THE INVENTION]**

In accordance with the present invention as described above, when a  
10 plurality of programs are being broadcasted on an RF channel, a program number of the program-being-watched and sub-channel symbols are displayed so that the user can easily confirm the number of the programs and select a desired program.

## **[PATENT CLAIMS]**

1. A method for displaying channels in a digital television receiver, comprising the steps of:  
5        selecting an RF channel;  
         when two or more programs are being broadcasted on the selected RF channel, selecting one of the programs as a program-being-watched; and  
         displaying the program number of the program-being-watched and sub-channel symbols corresponding respectively to the program numbers of the  
10 remaining programs in numeric order on a display while the program-being-watched is running.
2. The method according to claim 1, wherein said sub-channel symbols are displayed in forms indicating an up or down direction from the  
15 program number of the program-being-watched.
3. The method according to claim 2, wherein said program number of the program-being-watched and said sub-channel symbols are arrayed in a particular direction on the display.  
20
4. The method according to claim 3, wherein said displaying step further includes displaying the number of said selected RF channel above the array of the program number and the sub-channel symbols on the display.

5. The method according to claim 2, wherein said program selecting step further includes selecting a program with the lowest program number as the program-being-watched, among said two or more programs.

5 6. The method according to claim 2, wherein said sub-channel symbols are displayed in a form of ▲ or ▼ indicating an up or down direction from the program number of the program-being-watched.

7. A method for displaying channels in a digital television receiver,  
10 comprising the steps of:

selecting an RF channel;

when two or more programs are being broadcasted on the selected RF channel, selecting one of the programs as a program-being-watched;

displaying the program number of the program-being-watched and sub-  
15 channel symbols corresponding respectively to the program numbers of the remaining programs in numeric order on a display while the program-being-watched is running; and

changing the program-being-watched to a program corresponding to a  
program number selected using a channel up/down key, among the program  
20 numbers displayed in the up or down direction from the program number of the program-being-watched.

8. The method according to claim 7, wherein said sub-channel symbols are displayed in forms indicating an up or down direction from the

program number of the program-being-watched.

9. The method according to claim 8, wherein said program number of the program-being-watched and said sub-channel symbols are arrayed in a particular direction on the display.

10. The method according to claim 9, wherein said displaying step further includes displaying the number of said selected RF channel above the array of the program number and the sub-channel symbols on the display.

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11. The method according to claim 8, wherein said program selecting step further includes selecting a program with the lowest program number as the program-being-watched, among said two or more programs.

15 12. The method according to claim 8, wherein said sub-channel symbols are displayed in a form of ▲ or ▼ indicating an up or down direction from the program number of the program-being-watched.

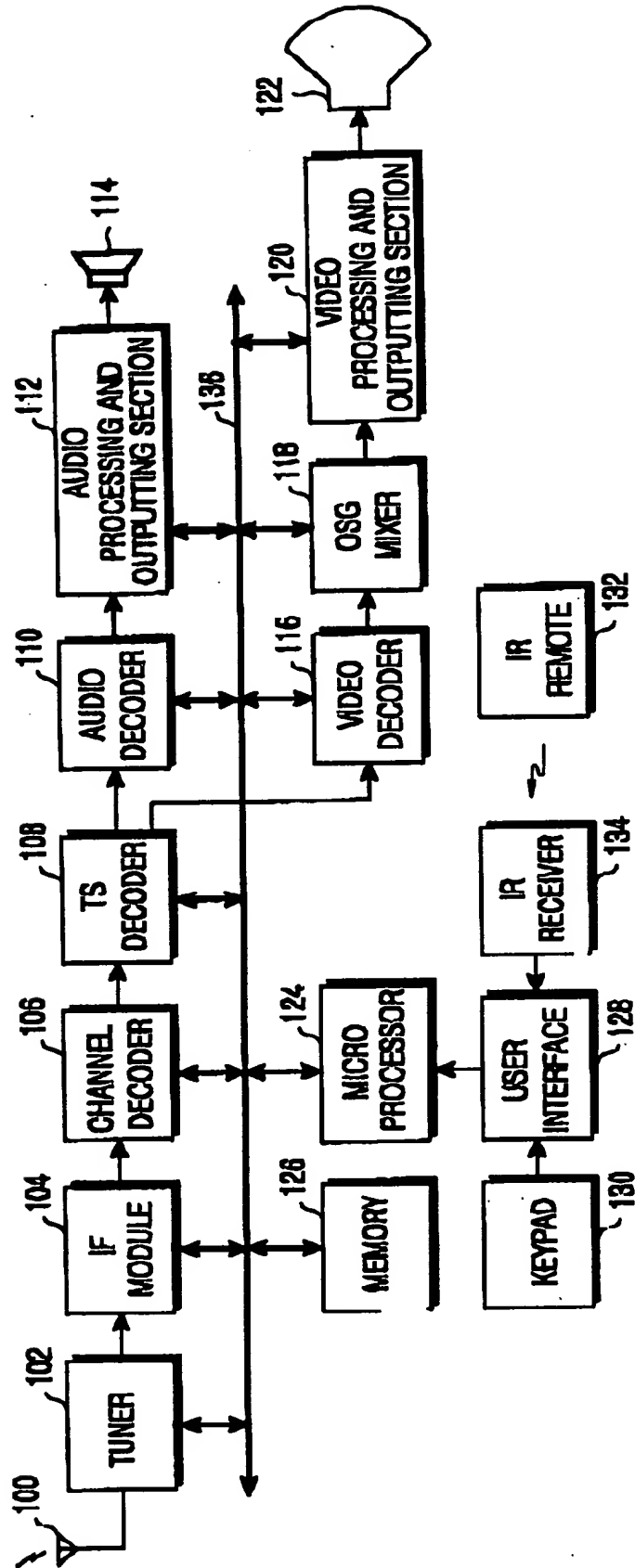


FIG.1



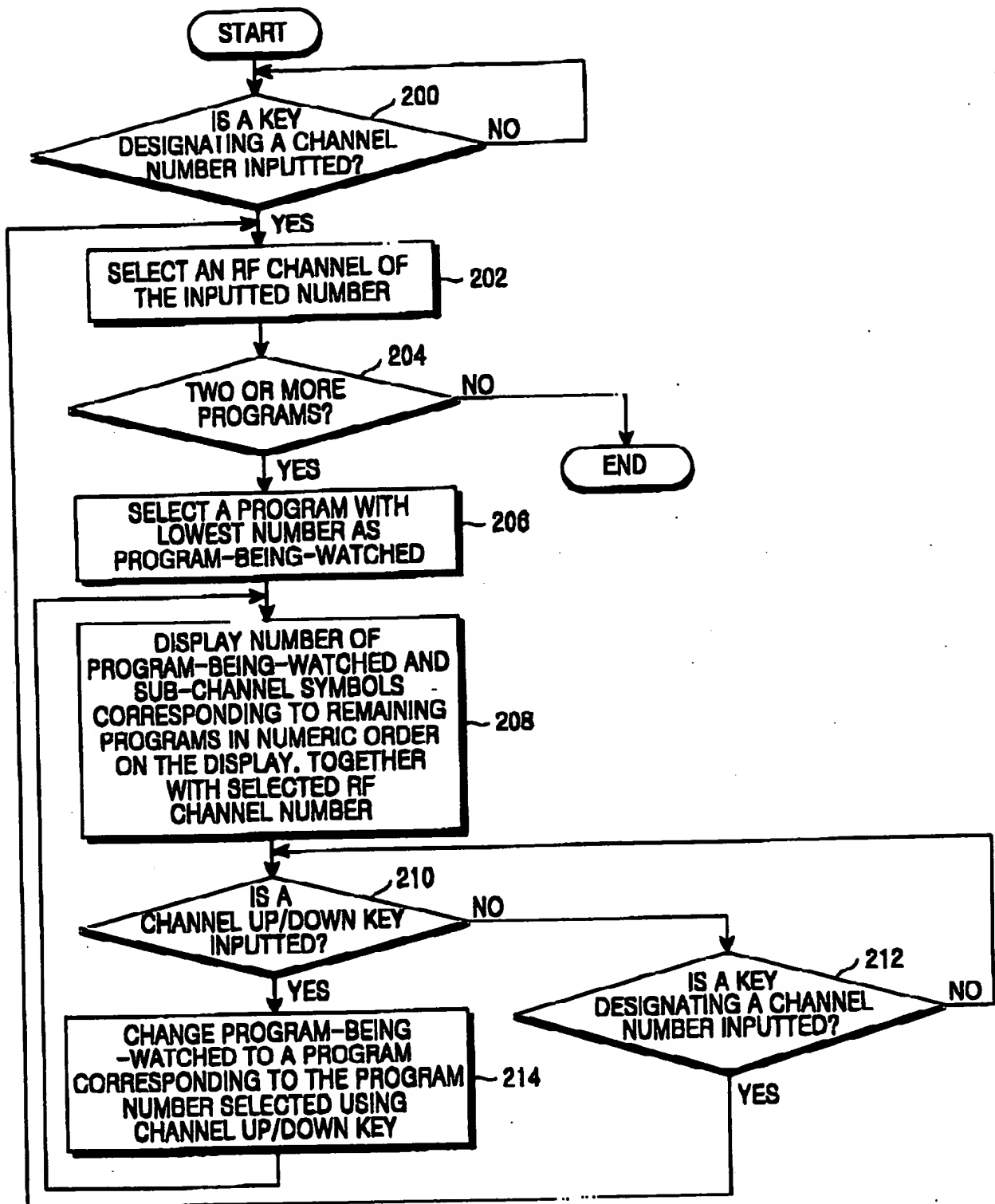
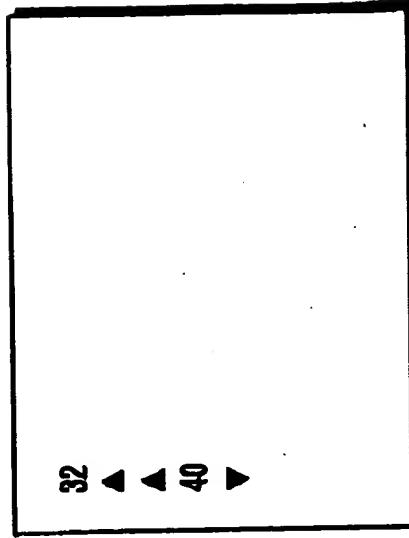


FIG. 2

(b)



(a)

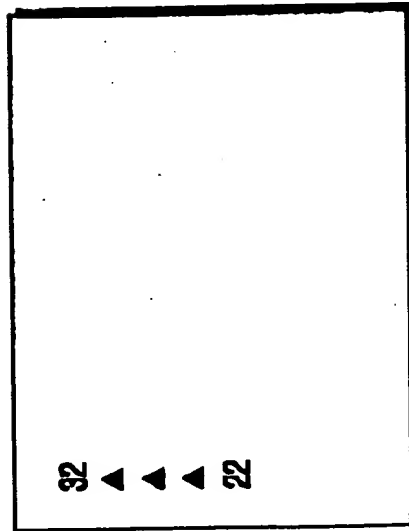


FIG.3